

by Adler

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U.S. 273/51

## FABRICATED BILLIARD CUE

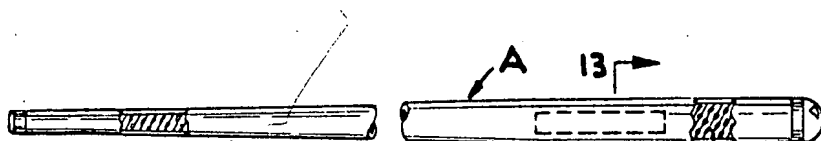


FIG. 1.

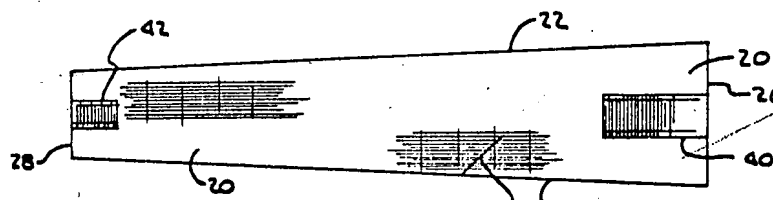


FIG. 2.

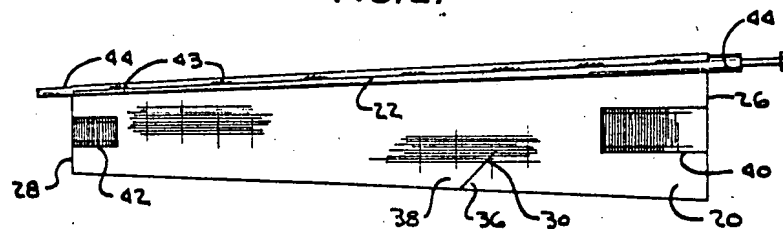


FIG. 3.

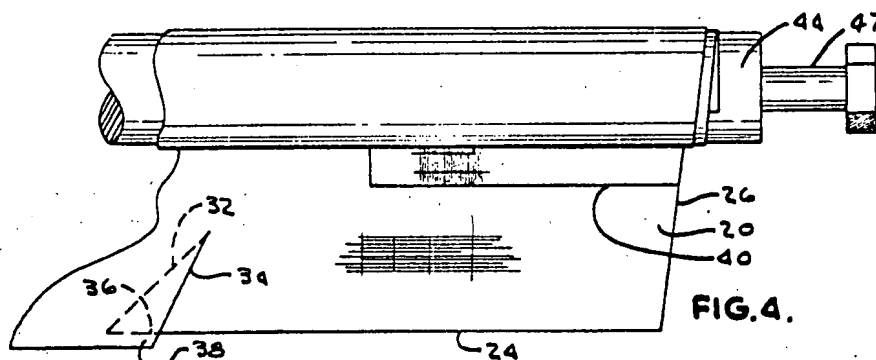


FIG. 4.

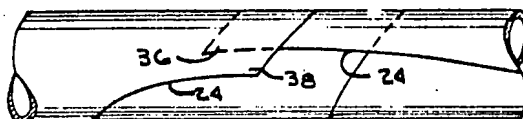


FIG. 5.

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No. 726,578



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# CANADIAN PATENT

FABRICATED BILLIARD CUE

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Granted to St. Croix Corporation, Park Falls, Wisconsin, U. S. A.

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No. OF CLAIMS 4

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The invention relates to an improvement in a rod structure and more particularly a billiard cue, the same being formed from resin impregnated glass fiber cloth in substantially a cylindric shape and filled with a foamed resin.

A billiard cue, fishing rod and the like are preferably made of a material which is unaffected by moisture and temperatures not in the extreme and which allows variation of weight and flexural strength. A material which can be used to accomplish the above is resin impregnated glass cloth  
10 built up in laminations or layers to form a hollow rod. The compressive strength and the flexural strength of a rod of a given wall thickness can be increased by filling the rod with foamed resin of varying density which adheres to the inside wall surface of the rod.

It is an object of the invention to provide a laminated hollow rod construction for a billiard cue of resin impregnated glass cloth formed of a pattern having a configuration for rolling the same into a hollow rod which produces a superior rod body from the standpoint of uniformity of wall thickness  
20 and strength, regularity of surface, desirable compressive and flexural strength and which is unaffected by moisture and ordinary temperature.

It is also an object to provide a rod construction for a billiard cue having new and novel construction for weighting and balancing the cue.

It is also an object to provide a new and novel lower cap end and resilient butt construction for a hollow billiard cue which fully protects the lower end of the cue.

It is a further object to provide a new and novel tip  
30 construction for the upper end of the cue.



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It is an additional object to provide a reinforced tip and base ends for the rod body construction.

It is a still further object to provide a new and novel mandrel on which a cue body is formed.

It will not be here attempted to set forth and indicate all of the various objects and advantages incident to the invention, but other objects and advantages will be referred to in or else will become apparent from that which follows.

The invention will appear more clearly from the following detailed description when taken in connection with the accompanying drawings, showing by way of examples preferred embodiments of the inventive idea wherein like numerals refer to like parts throughout.

In the drawings forming part of this application:

Figure 1 is a longitudinal elevation of a billiard cue embodying the invention, portions of which are broken away, other portions being in sections.

Figure 2 is a top plan view of the pattern of resin impregnated glass cloth including the reinforcement portions thereon.

Figure 3 is a top plan view of a mandrel with one longitudinal edge of the pattern tacked to the same as the beginning step of wrapping the glass fiber cloth pattern thereon.

Figure 4 is an enlarged elevation of a portion of one end of the mandrel with the pattern being wrapped on the mandrel except for a portion of the pattern.

Figure 5 is an enlarged elevation of a portion of the rod with the wrapping completed.

Figure 6 is an elevational view of the wrapped rod being wrapped with cellophane.

Figure 7 is a longitudinal section of a portion of the cue rod body showing one form of weight means therefor.

Figure 8 is a longitudinal section of a portion of the rod showing another form of weight means therefor.

Figure 9 is an elevational view of the end member for the weight rod of Figure 8.

Figure 10 is a longitudinal section of a portion of the rod showing a still further form of weight means for the rod.

Figure 11 is an illustration of a hollow weighted rod member being filled with foamed resin.

Figure 12 is a section on the line 12-12 of Figure 6.

Figure 13 is a section on the line 13-13 of Figure 1.

Figure 14 is an enlarged longitudinal elevation of the completed rod, a portion thereof being broken away.

Figure 15 is a section on the line 15-15 of Figure 14.

Figure 16 is a top plan view of the butt cap.

Figure 17 is a longitudinal sectional view of the female base portion of the tip.

Figure 18 is a longitudinal sectional view of the male portion of the tip, a portion of which is shown in full lines.

Figure 19 is a sectional view on the line 19-19 of Figure 18.

Figure 20 is an exploded perspective view of the female and male portions of the tip.

Figure 21 is a perspective view of the butt plug removed from the cue butt cap.

Figure 22 is a perspective view of the butt cap removed from the cue.

Figure 23 is an elevational view of the mandrel used in forming the cue body.

Referring to the drawings in detail, the cue rod A includes

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in the formation thereof the resin impregnated woven glass fiber cloth pattern 20. The cloth forming the pattern 20 is made up of a warp and woof, the warp strands being generally ten to one of the woof strands with the warp strands running longitudinally of the pattern 20. The pattern 20 is <sup>cut</sup> ~~cut~~ from the cloth in the form of <sup>Isosceles trapezoid</sup> ~~trapezium~~ with two non-parallel longitudinal edges 22 and 24 and the two parallel transverse edges 26 and 28. The non-parallel edges 22 and 24 are greater in length than the parallel edges 26 and 28. The pattern 20  
10 has a cut 30 formed therein beginning at the non-parallel edge 24 and extending from the edge into the cloth towards the longer of the transverse edges which is 26. The cut 30 is intermediate the end edges of the pattern. The cut 30 forms the edges 32 and 34, the cut edge 32 forming with the edge 24, the acute angle pointed portion 36, and the cut edge 34 forming with the edge 24 the obtuse angle pointed portion 38.

Further provided is a base reinforcing strip 40 which is cut from the same or similar woven glass fiber cloth forming pattern 20 and generally in the form of a rectangle. The  
20 reinforcing strip 40 is positioned on the pattern substantially centrally of the width thereof but not necessarily so with the lower outer edge of the strip 40 in alignment with the edge 26 of the pattern 20. The strip 40 adheres to the pattern by reason of the resin impregnation thereof. The strip 40 is positioned so that the warp strands run transversely of the pattern 20, and therefore at right angles to the warp strands of the pattern 20. As a result, the thickness of the rod wall at the strip is not only increased slightly but the pattern 20 strengthened by reason of the warp of the pattern and the  
30 warp of the strip being normal to each other.

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A tip reinforcing strip 42 is also provided which is similar to strip 40 but slightly smaller with the warp thereof running normal to the warp of the pattern 20 and providing reinforcement for the tip end of the cue A as set out above for the base. The tip reinforcing strip 42 adheres to the pattern due to the resin impregnation of the same. The resin impregnated into the fiber glass cloth of the pattern 20 and strips 40 and 42 is preferably thermo setting but becomes quite tacky when it is initially heated. It has been found that several known resins including <sup>phenolic</sup> phenolic, epoxy and polyester are quite satisfactory. The pattern 20 is cut to a size which will give a number of layers when it is wrapped about a tapered mandrel such as 44 of a given size. The piece of cloth forming the pattern 20 has its longest dimension slightly greater than the length of the desired rod so that the cloth pattern wraps around the mandrel somewhat as a whole rather than a spiral strip with the particular advantages hereinafter set forth.

The next step in the order of fabrication is to tack one longitudinal edge, such as 22, to the mandrel 44 as at 43 with the edge 22 in a plane through the center line of the mandrel. The tacking may be done with a thermoplastic resin. The mandrel 44 has an overall length of 65 inches, referring particularly to Figure 18, and has no taper but a constant diameter at the upper outer end for substantially three inches and no taper or a constant diameter at the base portion for about 20 inches but does have a taper centrally thereof from point "x" to point "y" which points are the inner termination of the portions of no taper of the base and tip. With the straight or constant diameter portions on the tip and base ends, a cue may be made

shorter than the 65-inch mandrel by using a pattern of less length. Patterns of various lengths may be positioned on the mandrel utilizing portions of the straight portions of the mandrel but in no event totally eliminating the straight portion either at the tip or at the base, particularly Figure 23. The mandrel 44 may be either solid or tubular and preferably of stainless steel with a smooth surface. Further the outer surface of the mandrel may be tapered or not and of a dimension desired in the interior of the tube to be converted into a  
10 billiard cue body.

With the edge 22 of the pattern 20 tacked to the mandrel 44, particularly Figure 3, the mandrel is rotated to roll onto the same a number of layers of the pattern. As the rolling is done the cloth pattern is placed under a slight tension whereby the same is wound tightly upon the mandrel and upon itself. The cloth pattern 20 must be wound upon the mandrel and upon itself with an absence of wrinkles or slight bunching with a resulting wall thickness which is uniform substantially throughout the length of the rod. To accomplish this the  
20 pattern is formed as a <sup>Isosceles trapezoid</sup> ~~trapezium~~ as in Figures 2 and 3, and important here is the cut 30 which allows the pattern to overlay itself smoothly as it is rolled upon the mandrel, for the upper portion of the pattern rolls upon mandrel at a greater linear speed than the lower portion which has a greater diameter. As the rolling or winding of the pattern upon the mandrel proceeds, crowding of material begins to occur in the vicinity of the cut 30, and as the winding approaches completion, the pointed portion 36 is caused to underlay the pointed portion 38, particularly Figures 4 and 5, thereby producing a relatively  
30 smooth surfaced wound tubular rod. The fiber glass cloth



Figure 7 is shown a coil spring 50 having an outside diameter which is equal to the inside diameter of the rod as at E. The spring 50 is dropped into the open lower end of the rod 48, the spring weight being properly positioned by the same engaging inner diameter of the rod 48 thereby giving proper balance to the cue. The tubular rod 48 is then filled with a foam mixture of resin such as a polyester and an isocyanate and a vaporizing foaming agent which can be accomplished with a gun such as 52 by inserting the nozzle thereof into the rod 48, Figure 11. The resin foam 53 fills the entire inside content of the rod and in and around the coils of the spring weight 50. The spring weight is positioned somewhat as indicated in broken lines in Figures 1 and 11. The foam further locks the spring weight in place.

After the foam core 53 is in place any irregularities in the outer surface may be sanded off. The sanded surface is then given a coat of "filler" which is sanded and then several finish coats are applied and baked.

In Figure 8 is illustrated a further embodiment of a weight for the billiard cue which includes the elongated metal rod 54 and secured to each end of the rod is a disc-like end support member 56. The disc-like support member 56 has formed on the outer annular edge thereof a plurality of radially extending pointed portions 58. The outer diameter of the pointed portions 58 is slightly greater than the inside diameters of the hollow cue rod at points F and G between which points it is desired to place the weight rod 54. In placing the weight rod 54 in the hollow cue 48 the same is secured in position with the end members 56 jammed at the predetermined points F and G which gives the proper positioning of the weight and

pattern adheres to itself with the application of a slight amount of heat and pressure due to the resin impregnation thereof.

10 With the desired number of layers of cloth pattern upon the mandrel, a wide length of wet or dry cellophane 46 is spirally wound upon the length of the rod, particularly Figure 6. The greater the number of cellophane wrappings and the tension thereof, the greater the pressure exerted upon the glass cloth layers. Figure 12 is a cross section of a rod with the cellophane layers in slight compression thereon. The cellophane may be wrapped upon the fiber cloth either wet or dry. The mandrel 44 together with the cloth layers of pattern 20 and the cellophane wrappings 46 are baked to cure the resin impregnating the glass cloth and thereby set the resin. The baking is at 200° for one-half hour, 250° for a second one-half hour and 300° for a further fifty minutes.

20 In the process the cellophane is shrunk uniformly and applies pressure around the glass cloth layers of pattern 20. Such pressure and heat compresses the cloth wrappings 20 and causes flow of impregnating resin in and through the cloth and into all the voids therein and brings the outer edge 24 of the cloth up to the preceding wrapping so closely that the line of joining is almost indistinguishable. The mandrel 44 is then pulled from the wrappings by means of the pin 47 with the wrappings in the form of a tube with the internal shape the size of the mandrel. The rod with the cellophane wrappings thereon is soaked in water to easily remove the cellophane by unwinding the same.

30 The tubular rod 48 is weighted to give the cue proper balance and this is done by the devices of Figures 7-10. In

desired balance in the cue rod A. The position of the weight rod 54 is checked by measuring the distance from the outer end member 56 to the outer end of the cue rod body. The weight rod 56 is secured in position in the cue body 48 before the cue is foam filled as heretofore set forth. The position of the weight rod 54 is substantially as shown in broken lines in Figures 1 and 11.

In Figure 10 is a still further embodiment of a weight for the billiard cue which includes the weight member 60 which is a plug formed of sand and resin. The weight 60 is formed by pouring a mixture of sand and resin into the cue body 48 which locates against a plug 62 previously positioned in the cue body. After the weight member has set, the same is locked in position by a foam filling from the lower open end of the cue body 48 and the upper end of the cue body.

In Figure 14 of the drawings is found a longitudinal section of particularly the upper tip end of the cue and the lower base end thereof with Figures 15-22, illustrating the same in fuller detail. The numeral 64 designates the tip, and it includes the upper outer plastic disc-like portion 66 which terminates in the shoulder 67 and conical fillet formation 68. A threaded shank in the form of a bolt 70 having the head portion 72 molded axially within the plastic portions 66 and 68 with the threaded portion extending therefrom. The conical fillet portion 68 strengthens the connection of the portion 66 with the bolt portion 70 and aids in the secure positioning of the male portion in the female base portion hereinafter described. The outer end of the portion 66 is formed with the shallow circular recess 74 thereby forming the annular rib 75. The circular recess 74 is formed with a slight waffle surface 76,

the recess forming a glue reservoir for the conventional outer felt tip member 78. With the recess 74, the tip 78 is caused to lie in a single plane. The portion 66 and the bolt 70 constitute the male portion of the tip 64.

As a further part of the tip 64 there is provided the cylindrical female base portion 80 which has the threaded axial bore 82 formed therethrough terminating in the slightly enlarged annular recess 84 which in turn terminates in the frusto-conical axial recess 86 terminating at the outer end of the circular head portion 88, the diameter of the head portion 88 being greater than the base portion 80 thereby forming the annular shoulder 90. The outer surface of the cylindrical base portion 80 is formed with longitudinally extending grooves 92 which act as glue reservoirs to materially aid in securing the same within the hollow upper end of the cue body 48 as particularly illustrated in Figure 15.

The tip 64 is assembled by screwing the threaded bolt portion 70 into the threaded hole 82 of the female base portion 80 with the shoulder 67 in tight abutment with the outer face of circular head portion 88 and the conical portion 68 in intimate contact with the conical recess 86 which aids in absorbing the shock load when the tip is caused to strike a billiard ball. The female base portion 80 is then glued within the upper end of the cue body 48 as heretofore described.

Further provided is the butt cap 94 which includes the hollow cylindrical portion 96 which has formed on the lower end thereof the annular raised rib 98 which forms the annular shoulder 100. The annular rib 98 diameter is the same as the diameter of the end of the cue body. The annular rib 98 terminates in the end wall 102 formed with axial hole 104.

Extending inwardly and axially of the hole 104 is the annular collar portion 106 which together with the wall portion 102 forms a firm bearing surface for the base plug 108 hereinafter described. The cap 94 is strengthened by means of the web portions 110 extending longitudinally from the inner surface of cylindrical portion 96 to the end wall portion 102 and collar portion 106. The outer surface of the hollow cylindrical portion 96 is formed with a multiplicity of longitudinally extending grooves 112 which serve as glue reservoirs to materially aid in securing the cap 94 within the lower end of the cue body, as particularly shown in Figure 15, where the annular shoulder 100 abuts the lower edge of the cue body 48. With the diameters of the lower end of the cue body 48, the annular rib 98 of the butt cap and the outside diameter of the plug 108 identical, the chance of breakage due to abusive handling of the cue is greatly reduced at the butt.

The base plug 108 is formed of a resilient material such as rubber or the like and includes the half-spherical end portion 114, the outer diameter of which is the same as that of the annular cap rib 98. Extending axially of the inner flat shoulder portion 116 of the end portion 114 is the cylindrical extension portion 118 and formed on the outer surface thereof is the annular rib 120 spaced from the flat shoulder portion 116. The distance from the rib 120 to the portion 116 is slightly less than the distance from the inner edge of the collar 106 to the outer edge of the axial hole 104 whereby the rib 120 tightly engages the inner edge of the collar 106 when the same is deformed and forced through the hole 104. As a result, the flat shoulder portion 116 is held in contact with the end wall 102 of the butt cap 94.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A fabricated billiard cue body of high compressive and high flexural strength comprising:

- (a) a tubular body of resin impregnated glass fiber cloth,
- (b) said glass cloth being a continuous pattern piece in the form of an isosceles trapezoid with the two non-parallel edges of a greater dimension than the two parallel edges,
- (c) said non-parallel edges converging equally with respect to said parallel edges,
- (d) said glass cloth being wrapped in layers generally along one of the non-parallel edges and bonded by resin and
- (e) having a joint substantially longitudinally of the tube.

2. A fabricated billiard cue body of high compressive and high flexural strength comprising:

- (a) a tubular body of resin impregnated glass fiber cloth,
- (b) said glass cloth being a continuous pattern piece in the form of an isosceles trapezoid with the two non-parallel edges of a greater dimension than the two parallel edges,
- (c) said cloth pattern having a cut extending into the same from one of said non-parallel edges toward the longer of the parallel edges.

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- (d) said cloth being wrapped in layers generally along one of the non-parallel edges and bonded by resin and
- (e) having a joint substantially longitudinally of the tube.

3. A fabricated billiard cue body of high compressive and high flexural strength comprising:

- (a) a tubular body of resin impregnated glass fiber cloth having a warp and a woof,
- (b) said glass cloth being a continuous pattern piece in the form of an isosceles trapezoid with the two non-parallel edges of a greater dimension than the two parallel edges,
- (c) a reinforcing strip of resin impregnated glass fiber cloth having a warp and a woof,
- (d) said reinforcing strip positioned on said pattern cloth piece with the warp thereof running normal to the warp of the pattern piece and
- (e) one edge of said reinforcing strip being substantially in alignment with one of the parallel edges,
- (f) said glass cloth being wrapped in layers generally along one of the non-parallel edges and bonded by resin and
- (g) having a joint substantially longitudinally of the tube.

4. The fabricated billiard cue body of claim 3 wherein

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said cloth pattern has a cut extending into the same from one of said non-parallel edges towards the longer of the parallel edges.





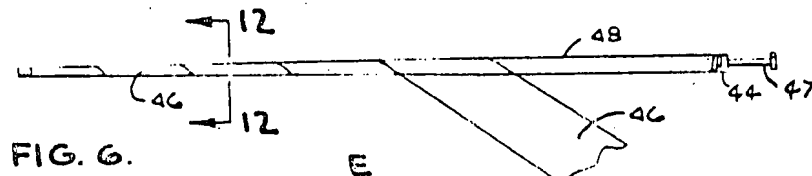


FIG. 6.

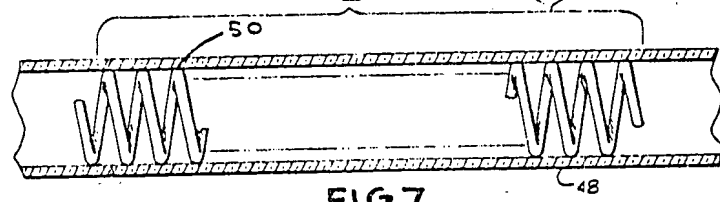


FIG. 7.

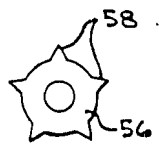


FIG. 9.

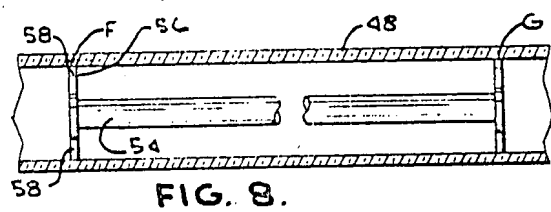


FIG. 8.

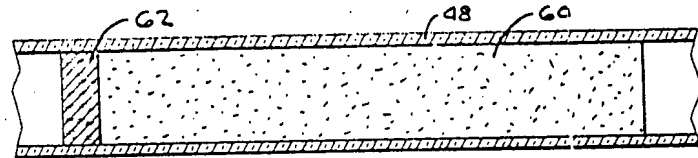


FIG. 10.

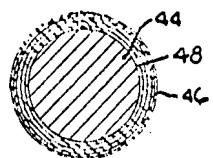


FIG. 12.

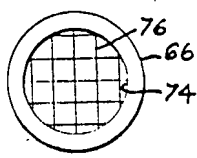


FIG. 19.

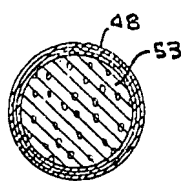


FIG. 13.

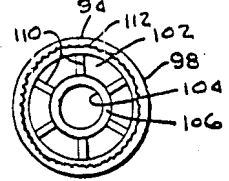


FIG. 16.

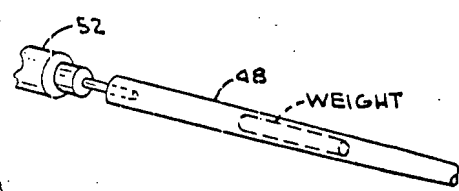


FIG. 11.

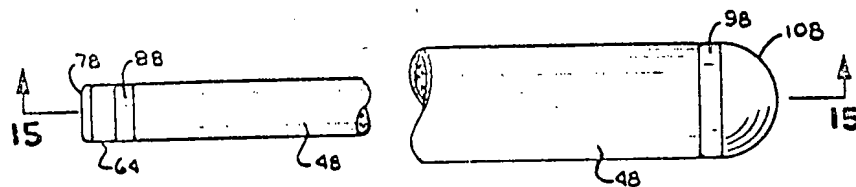


FIG. 14.

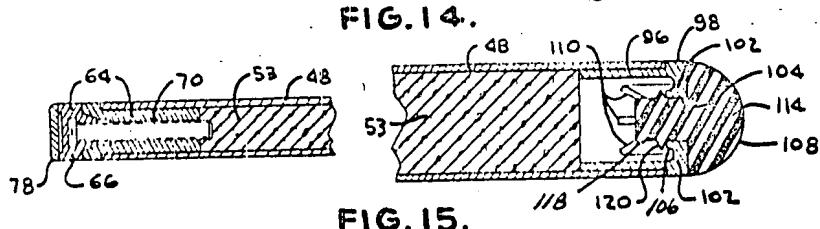


FIG. 15.

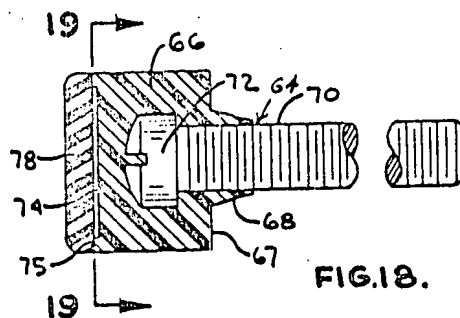


FIG. 18.

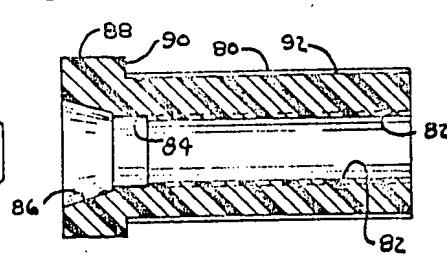


FIG. 17.

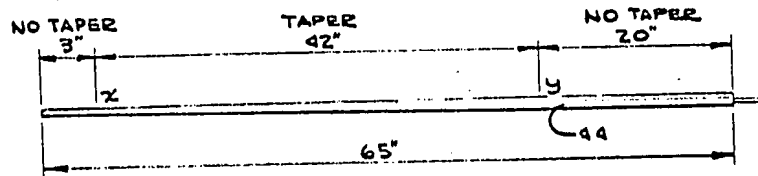


FIG. 23.

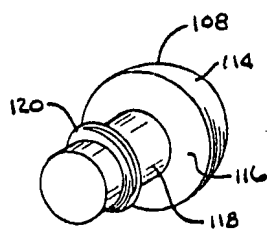


FIG. 21.

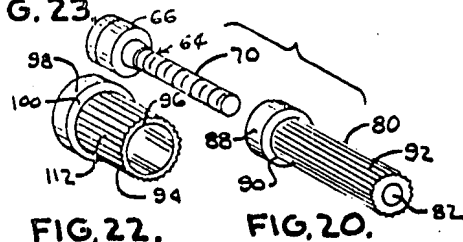


FIG. 22.

FIG. 20.